

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: David J. Vachon et al. Examiner: Kishor Mayekar  
Serial No. To be assigned Group Art Unit: 1741  
Filed: December 12, 2001 Docket: G&C 130.1-US-C1  
Title: MICROELECTROGRAVIMETRICALLY PLATED BIOSENSORS AND  
APPARATUS FOR PRODUCING SAME

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By:

Name: Isabell Ogata

PRELIMINARY AMENDMENT

Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Prior to a first Office Action, please amend the above-identified application as follows.  
Please note that in compliance with the new rules under 37 C.F.R. 1.121, the amended specification is presented in "clean" form, with a marked-up version provided in the Appendix.

IN THE SPECIFICATION

On page 1, please amend the title to read --MICROELECTROGRAVIMETRICALLY  
PLATED BIOSENSORS AND APPARATUS FOR PRODUCING SAME--

On page 1, after the title, please insert the following paragraph:

This application is a continuation of application Serial No. 09/642,623, filed August 18, 2000, which application claims the benefit of United States provisional patent application Serial No. 60/204,408, filed on May 16, 2000.

IN THE CLAIMS

Please cancel original claims 1-26, and add claims 27-49 as follows:

27. An electrode produced by the process of:
- (a) dispensing a solution containing an electroactive species from a microdispenser to form a hanging drop of the solution;
  - (b) contacting an electrode with the hanging drop of the solution, wherein the electrode is electrically coupled with the microdispenser to form an electrochemical cell; and
  - (c) applying an electrical current to the electrochemical cell, wherein the application of the current effects deposition of the electroactive species onto the electrode.
28. The electrode of claim 27, which comprises gold, platinum, palladium, chromium, copper, aluminum, nickel, zinc, titanium, cobalt-nickel-chromium alloy, or titanium-aluminum-vanadium alloy.
29. The electrode of claim 27, wherein the electroactive species comprises a metal salt.
30. The method of claim 29, wherein the metal salt comprises hydrogen hexachloroplatinate.
31. The electrode of claim 27, wherein the current applied has a density of about 5 to about 25 mA/cm<sup>2</sup>.
32. The electrode of claim 31, wherein the current applied has a density of about 10 to about 20 mA/cm<sup>2</sup>.
33. The electrode of claim 30, wherein the current applied is about 20 to about 60  $\mu$ A, and the voltage is about 5 to about 15 volts.
34. The electrode of claim 33, wherein the current is about 45 to about 50  $\mu$ A, and the voltage is about 8 to about 10 volts.



48. An apparatus for depositing an electroactive species onto a plurality of electrodes, the apparatus comprising:
- (a) a microdispenser capable of dispensing a solution containing the electroactive species to form a hanging drop of the solution;
  - (b) an electrode holder capable of placing the electrodes in electrical contact with the microdispenser to form an electrochemical cell;
  - (c) a potentiometer disposed between the microdispenser and the electrode holder; and
  - (d) a conveyor adapted to bring each of the electrodes into electrical contact with the microdispenser.
49. The apparatus of claim 48, wherein the microdispenser comprises a pipette.

REMARKS

Prior to a first Office Action in this application, Applicants request that the specification be amended, original claims 1-26 cancelled, and new claims 27-49 added. These amendments and new claims do not involve any new matter or objectionable changes. When the Examiner takes this application up for action he is requested to take the foregoing into account.

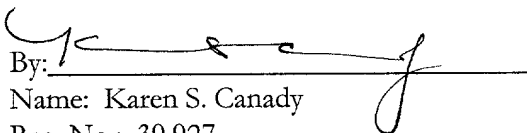
It is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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KSC/10

APPENDIX: SPECIFICATION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

On page 1, please amend the title to read –MICROELECTROGRAVIMETRICALLY  
PLATED BIOSENSORS AND APPARATUS FOR PRODUCING SAME--.

## ABSTRACT

Disclosed is a method for microelectrogravimetrically depositing an electroactive species onto an electrode or a plurality of electrodes comprising dispensing a solution containing the electroactive species from a microdispenser to form a hanging drop of the solution and contacting the electrode with the hanging drop of the solution, wherein the electrode is electrically coupled with the microdispenser to form an electrochemical cell, and applying a potential to the electrochemical cell. The application of the potential effects deposition of the electroactive species onto the electrode. The method of the invention eliminates the need for immersion of the electrode in a bath, reduces the volume of solution required by a factor of at least 10-100, and avoids uneven depletion of various components of the solution over successive applications. The method reduces costs, provides for increased reproducibility in the plating process and avoids contamination of the solution, and is particularly suited for plating of enzymes, such as glucose oxidase, or metals, such as platinum, onto electrodes for use as biosensors.